

WHAT IS CLAIMED IS:

- 1                   1.     A method for creating a copy of data in a system comprising a  
2 plurality of storage devices, a control unit operable to control said storage devices, at least  
3 one of a plurality of processing units operable to access said control unit, and a buffer  
4 memory operable to temporarily store data read from said storage devices within said  
5 control unit, said storage devices addressable as at least one of a plurality of logical  
6 volumes, including a first logical volume and a second logical volume, said method  
7 comprising:  
8                         specifying a relationship between at least two of said logical volumes, said  
9 relationship defined between said first logical volume and said second logical volume;  
10                        creating a copy of data in said specified first logical volume into said  
11 second logical volume; said creating a copy further comprising:  
12                         copying data from said first logical volume to a first location in  
13 said buffer memory;  
14                         copying said data from said first location in said buffer memory to  
15 a second location in said buffer memory;  
16                         copying said data from said second location in said buffer memory  
17 to said second logical volume;  
18                         wherein said copying said data from said first location in said buffer  
19 memory to a second location in said buffer memory is performed by said control unit  
20 substantially independently of said processing units.
- 1                   2.     The method of claim 1, wherein said copying said data from said  
2 first location in said buffer memory to a second location in said buffer memory further  
3 comprises:  
4                         reading data from said first location in said buffer memory into a buffer  
5 location within an address change unit;  
6                         exchanging a logical address within said data from an address  
7 corresponding to said first logical volume to an address corresponding to said second  
8 logical volume; and  
9                         writing said data to said second location in said buffer memory.
- 1                   3.     The method of claim 1 further comprising: if a write request is  
2 issued to said first logical volume after creating a copy has commenced,

3                   creating a copy of data in said first logical volume to said secondary  
4   logical volume before said data in said primary volume is modified by said write request.

1                   4.     The method of claim 1 wherein said relationship further comprises:  
2   a pairing of a primary volume and a secondary volume.

1                   5.     The method of claim 1 further comprising: modifying a location  
2   identifier defined in each logical volume.

1                   6.     The method of claim 1 further comprising: making said second  
2   logical volume accessible after said creating a copy of data in said specified first logical  
3   volume into said second logical volume.

1                   7.     The method of claim 1 further comprising: tracking modified data,  
2   if a write request is issued to said first logical volume or said second logical volume after  
3   the copy processing is completed, and  
4                   copying said modified data based upon said tracking, if creating a copy is  
5   directed again to the pair in copy completed status.

1                   8.     The method of claim 1 further comprising: deleting said  
2   relationship.

1                   9.     The method of claim 1 wherein said first logical volume is defined  
2   as a primary logical volume, said method further comprising:  
3                   defining at least one of a plurality of different logical volumes as  
4   secondary logical volumes; and  
5                   defining multiple pairs comprising said primary logical volume and one of  
6   said plurality of second logical volumes.

1                   10.    The method of claim 9 wherein data in said secondary logical  
2   volumes comprises a series of historical records of said primary volume, said historical  
3   records obtained by switching said secondary logical volumes one after another.

1                   11.    The method of claim 1 further comprising: displaying information  
2   about said first logical volume and said second logical volume.

1                   12. A method for controlling the copying of information from a first  
2 logical volume to a second logical volume in a computer system, said method comprising:  
3                   specifying a relationship between said first logical volume and said second  
4 logical volume;  
5                   creating a copy of data in said first logical volume into said second logical  
6 volume; said creating a copy further comprising:  
7                   copying data from said first logical volume to a first location into a  
8 buffer memory;  
9                   copying said data from said first location in said buffer memory to  
10 a second location in said buffer memory;  
11                   copying said data from said second location in said buffer memory  
12 to said second logical volume;  
13                   wherein said copying said data from said first location in said buffer  
14 memory to a second location in said buffer memory is performed by a control unit  
15 substantially independently of a central processing unit.

1                   13. A method for controlling the copying of information from a first  
2 logical volume to a second logical volume in a computer system, said method comprising:  
3                   specifying a relationship between said first logical volume and said second  
4 logical volume;  
5                   copying data read from said first logical volume into a buffer memory  
6 located within a control unit and thereupon writing said data to said second logical  
7 volume; and  
8                   wherein said copying said data from said first location in said buffer  
9 memory to a second location in said buffer memory is performed by said control unit  
10 substantially independently of a central processing unit.

1                   14. A computer system comprising a plurality of storage devices, a  
2 control unit operable to control said storage devices, at least one of a plurality of  
3 processing units operable to access said control unit, and a buffer memory operable to  
4 temporarily store data read from said storage devices within said control unit, said storage  
5 devices addressable as at least one of a plurality of logical volumes, including a first  
6 logical volume and a second logical volume, said control unit operatively disposed to:

7                   establish a relationship between at least two of said logical volumes, said  
8 relationship defined between said first logical volume and said second logical volume;  
9                   create a copy of data in said specified first logical volume into said second  
10 logical volume; said creating a copy further comprising:  
11                   copy data from said first logical volume to a first location in said  
12 buffer memory;  
13                   copy said data from said first location in said buffer memory to a  
14 second location in said buffer memory;  
15                   copy said data from said second location in said buffer memory to  
16 said second logical volume;  
17                   wherein said copy said data from said first location in said buffer memory  
18 to a second location in said buffer memory is performed by said control unit substantially  
19 independently of said processing units.

1                   15.   The computing system of claim 14 wherein said copy said data  
2 from said first location in said buffer memory to a second location in said buffer memory  
3 further comprises:  
4                   reading data from said first location in said buffer memory into a buffer  
5 location within an address change unit;  
6                   exchanging a logical address within said data from an address  
7 corresponding to said first logical volume to an address corresponding to said second  
8 logical volume; and  
9                   writing said data to said second location in said buffer memory.

1                   16.   The computing system of claim 14 wherein said buffer further  
2 comprises 10 Gigabytes of storage.

1                   17.   The computing system of claim 14 wherein said plurality of storage  
2 devices further comprises a RAID.

1                   18.   The computing system of claim 14 further comprising a display,  
2 said display operable to depict information about said storage devices.

1                   19.   The computing system of claim 14, wherein said control unit  
2 further comprises a data recovery and reconstruct (DRR), said DRR operative to copy

3 said data from said first location in said buffer memory to a second location in said buffer  
4 memory; and thereupon change a volume number associated with said data.

1                   20. A computer program product for controlling the copying of  
2 information from a first logical volume to a second logical volume in a computer system,  
3 said computer program product comprising:  
4                   code for specifying a relationship between said first logical volume and  
5 said second logical volume;  
6                   code for creating a copy of data in said first logical volume into said  
7 second logical volume; said code for creating a copy further comprising:  
8                   code for copying data from said first logical volume to a first  
9 location into a buffer memory;  
10                  code for copying said data from said first location in said buffer  
11 memory to a second location in said buffer memory;  
12                  code for copying said data from said second location in said buffer  
13 memory to said second logical volume;  
14                  wherein said copying said data from said first location in said buffer  
15 memory to a second location in said buffer memory is performed by a control unit  
16 substantially independently of a central processing unit; and  
17                  a computer readable storage medium for holding the codes.

1                   21. A computer program product for controlling the copying of  
2 information from a first logical volume to a second logical volume in a computer system,  
3 said computer program product comprising:  
4                   code for specifying a relationship between said first logical volume and  
5 said second logical volume;  
6                   code for copying data read from said first logical volume into a buffer  
7 memory located within a control unit and thereupon writing said data to said second  
8 logical volume; and  
9                   wherein said copying said data from said first location in said buffer  
10 memory to a second location in said buffer memory is performed by said control unit  
11 substantially independently of a central processing unit; and  
12                  a computer readable storage medium for holding the codes.

1                   22. The computer program product of claim 21 further comprising:

2 code for displaying information about said first logical volume to a second  
3 logical volume.

1 23. A control unit for controlling the copying of information, said  
2 control unit operable in a computing system comprising at least one of a plurality of  
3 storage devices, said control unit operable to control said storage devices, at least one of a  
4 plurality of processing units operable to access said control unit, said storage devices  
5 addressable as at least one of a plurality of logical volumes, including a first logical  
6 volume and a second logical volume, said control unit comprising a buffer memory  
7 operable to temporarily store data read from said storage devices within said control unit,  
8 said control unit operatively disposed to:

9 copy data read from said first logical volume into a buffer memory located  
10 within said control unit;

11 copy said data from said buffer memory to a different location within said  
12 buffer memory, changing a volume identifier associated with said data, and thereupon  
13 writing said data to said second logical volume; and

14 wherein said copying said data from said first location in said buffer  
15 memory to a second location in said buffer memory is performed by said control unit  
16 substantially independently of a central processing unit.

1 24. A computer system comprising a plurality of storage devices, said  
2 storage devices addressable as at least one of a plurality of logical volumes, including a  
3 first logical volume and a second logical volume, at least one of a plurality of processing  
4 units, a cache memory operable to temporarily store data, and a control unit operable to  
5 store and retrieve data from said storage devices on behalf of said processing units;

6 wherein said control unit is further operable to copy data from a first logical  
7 volume to a second logical volume according to a relationship established between said  
8 first logical volume and said second logical volume; wherein said control unit copies said  
9 data from said first logical volume to a first location in said cache memory; whereupon a  
10 data recovery unit within said control unit is operable to create a copy of said data in said  
11 first location in said cache memory to a buffer location within said data recovery unit, and  
12 thereupon to copy said data from said buffer location within said data recovery unit into a  
13 second location in said cache memory; and thereupon to copy said data from said second  
14 location in said cache memory to said second logical volume;

15                    wherein said data comprises a logical address section, said logical address  
16 section having a data content that is changed during said copying between said cache  
17 memory and said buffer memory.

1                    25.     A computer system comprising:  
2                    a first means for storing data;  
3                    a second means for storing data;  
4                    a cache means for temporarily storing data;  
5                    a data recovery and reconstruction means for creating a copy of data from  
6 said first means for storing data into said cache means, and thereupon to create a copy of  
7 said data in said cache means into said second means for storing data,  
8                    wherein said data comprises a logical address section, said logical address  
9 section having a data content that is changed by said data recovery and reconstruction  
10 means from a physical address corresponding to said first means for storing data to a  
11 physical address corresponding to said second means for storing data.